search. To take a closer look at some of the most effective DRBs identified in routine screening, he used an electron microscope.

Strains of *Pseudomonas fluorescens* and *Flavobacterium balustinum* seemed to paste themselves directly to the plant cells and set up "factories" for producing toxic compounds. The tissue-cultured cells—like infected cells in whole plants—absorbed the compounds and became deformed and stunted.

Some 10 million cells of one strain of *P. syringae* applied to the standard half gram of tissue culture reduced the weight of fresh callus by 20 percent within 48 hours. And in preliminary field tests, the isolate has shown further promise, reducing leafy spurge root development. So far, the researchers have found a dozen examples of North American rhizobacteria that were highly toxic to the tissue and showed promise in field tests.

Yet to be screened are about a third of some 2,500 rhizobacteria cultures isolated from weedy *Euphorbia* species of Europe, as well as North America. Of those rhizobacteria screened already, about 30 percent are highly toxic to leafy spurge. Some of these may prove better suited than others for mass-production and commercial use.

Many DRB feed only on the juices of specific plants. But how do the scientists know whether some DRBs are not going to harm economically useful plants growing in the area where they might be applied?

"That's always a question we try to answer systematically through our research," says Kremer. Rhizobacteria not native to an area where they might be used merit greater scrutiny than native ones. Before outdoor tests can be done, scientists will conduct extensive indoor studies.—By **Ben Hardin,** ARS.

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Teaming Up Against Leafy Spurge

Leafy spurge thrives in varied habitats along the Little Missouri River, so it's difficult to control by any single method. The drainage area encompasses parts of Wyoming, Montana, and North and South Dakota. In this area, strategies developed during the past 17 years to control the weed are now being expanded on and demonstrated at various sites in an integrated pest management project called TEAM Leafy Spurge—The Ecological Areawide Management of Leafy Spurge. It emphasizes use of biological controls.

"TEAM Leafy Spurge is the first large-scale, systematic study to determine the most effective and economically feasible control methods to control leafy spurge," says ARS ecologist Gerald L. Anderson of Sidney, Montana.

Four primary study sites are located at Devils Tower in Wyoming; the South Fork of the Moreau River in South Dakota; Mill Iron, Montana; and Medora, North Dakota.

Anderson leads the project, along with entomologist Lloyd Wendel, who is with USDA's Animal and Plant Health Inspection Service in Mission, Texas. Several ARS and APHIS laboratories, state departments of agriculture, universities, cooperative extension services, other federal agencies, and private landowners participate as partners. This cooperative effort may serve as a model for other noxious weed programs across North America.

Progress on the 5-year project, which began last fall, is communicated through tours of field sites, newsletters, videotapes, a decision-making support computer program, and a site on the World Wide Web at http://www.team.ars.usda.gov. A field day planned for June 1999 will feature a demonstration of geographic information system and global positioning satellite technologies. These are used to inventory leafy spurge infestations and monitor effectiveness of the TEAM Leafy Spurge program.

Noxious weed control has historically relied on chemical herbicides. TEAM Leafy Spurge differs in that insect and pathogen biological control are the foundation on which other methods—such as grazing by sheep and goats, chemical herbicides, and periodic burning and reseeding of rangeland—are integrated and applied over large geographic regions.—By **Ben Hardin,** ARS.

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